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AUTHOR Morrongiello, Barbara A.; Roes, Caroline
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ABSTRACT

Toddlers (2 to 3 years) and preschool children (5 to 6 years) were repeatedly presented with a six-tone melody, then tested for their discrimination of a variety of pattern features, including the specific component frequencies, successive intervals, and general melodic contour. To manipulate the information-processing demands of the task, the presentation rate was varied among children. It was found that at the slowest rate, toddlers discriminated changes in specific component frequencies only, while at the fastest rate they discriminated changes in the general melodic contour only. At intermediate rates, they were sensitive to relational information and discriminated interval as well as contour changes. Preschoolers showed similar performance changes with increasing rates, but were sensitive to interval and contour information at even the slowest rate. Results indicate that children of all ages tested can encode specific as well as general pattern features when presented with sound sequences, and suggest that pattern discrimination performance at a given age reflects an interaction of the information-processing abilities of the listener and the demands of the task. (RH)

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CHILDREN'S PERCEPTION OF MUSICAL SEQUENCES

Barbara A. Morrongiello & Caroline Roes

University of Western Ontario

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Address correspondence to the first author, Psychology Department, U.W.O, London, Ontario, N6A 5C2, CANADA.

CHILDREN'S PERCEPTION OF MUSICAL SEQUENCES

BARBARA A. MORRONGIELLO & CAROLINE L. ROES

UNIVERSITY OF WESTERN ONTARIO

TODDLERS AND PRESCHOOLERS WERE REPEATEDLY PRESENTED A SIX-TONE MELODY, THEN TESTED FOR THEIR DISCRIMINATION OF A VARIETY OF PATTERN FEATURES, INCLUDING: THE SPECIFIC COMPONENT FREQUENCIES, SUCCESSIVE FREQUENCY RELATIONS OR INTERVALS, AND THE PATTERN OF SUCCESSIVE FREQUENCY RELATIONS OR GENERAL MELODIC CONTOUR. TO MANIPULATE THE INFORMATION-PROCESSING DEMANDS OF THE TASK, WE VARIED PRESENTATION RATE ACROSS CHILDREN.

AT THE SLOWEST RATE, TODDLERS ONLY DISCRIMINATED CHANGES IN SPECIFIC COMPONENT FREQUENCIES. AT THE FASTEST RATE, THEY ONLY DISCRIMINATED CHANGES IN THE GENERAL MELODIC CONTOUR. AT INTERMEDIATE RATES, THEY WERE SENSITIVE TO RELATIONAL INFORMATION AND DISCRIMINATED INTERVAL AS WELL AS CONTOUR CHANGES. PRESCHOOLERS SHOWED SIMILAR PERFORMANCE CHANGES WITH INCREASING RATES BUT WERE SENSITIVE TO INTERVAL AND CONTOUR INFORMATION EVEN AT THE SLOWEST RATE.

THESE RESULTS INDICATE THAT, ACROSS AGE, CHILDREN CAN ENCODE SPECIFIC AS WELL AS GENERAL PATTERN FEATURES WHEN PRESENTED SOUND SEQUENCES, AND SUGGEST THAT PATTERN DISCRIMINATION PERFORMANCE AT A GIVEN AGE REFLECTS AN INTERACTION OF THE INFORMATION-PROCESSING ABILITIES OF THE LISTENER AND THE DEMANDS OF THE TASK.

BOTH SPEECH AND MUSIC ARE COMPLEX AUDITORY PHENOMENA, THE PERCEPTION OF WHICH REQUIRES CONSIDERABLE PATTERN PERCEPTION SKILLS.

WHILE THERE HAS BEEN RESEARCH EXAMINING CHILDREN'S PERCEPTION OF THE FEATURES OF SPEECH, MUCH LESS IS KNOWN ABOUT THEIR PERCEPTION OF PATTERN FEATURES RELEVANT TO MUSIC.

FURTHER, THERE HAVE BEEN FEW DEVELOPMENTAL INVESTIGATIONS OF AUDITORY PATTERN PERCEPTION SKILLS.

AIMS

1. TO EXAMINE TODDLERS' AND PRESCHOOLERS' PERCEPTION OF SEVERAL MUSICAL FEATURES, INCLUDING: THE SPECIFIC PITCHES OR FREQUENCIES; THE SPECIFIC SUCCESSIVE FREQUENCY RELATIONS OR INTERVALS; AND THE GENERAL SEQUENCE OF RISING AND FALLING PITCHES OR CONTOUR.

2. TO DETERMINE WHETHER MANIPULATIONS OF TASK DIFFICULTY WOULD INVOLVE THE DIFFERENTIAL PERCEPTION OF THESE MELODIC FEATURES.

SUBJECTS

TODDLERS (2-3 YEARS) AND PRESCHOOLERS (5-6 YEARS)

STIMULI

EACH MELODY COMPRISED SIX SQUARE-WAVE TONES AND WAS PLAYED AT CONVERSATION LEVEL IN A SOUND-ATTENTUATING CHAMBER.

THE STANDARD MELODY, TRAINING MELODY, AND TEST MELODIES ARE REPRESENTED IN **TABLE 1** AND **FIGURE 1.**

THE TEST MELODIES INTRODUCED CHANGES IN THREE FEATURES:

(1) ABSOLUTE FREQUENCIES
(I.E., REPLACEMENT OF ALL NOTES BY TRANSPOSITION OF THE STANDARD MELODY TO A NEW KEY)

(2) RATIO OF SUCCESSIVE FREQUENCIES OR INTERVALS (E.G., A REORDERING OF SOME NOTES)

(3) PATTERN OF DIRECTIONAL CHANGES IN FREQUENCY OR CONTOUR (E.G., A REORDERING OF SOME NOTES THAT VIOLATES THE CONTOUR OF THE STANDARD MELODY).

TO MANIPULATE TASK DIFFICULTY, MELODIES WERE PRESENTED AT DIFFERENT RATES: 1.5, 2.5, 4.5, OR 5.5 TONES/SECOND.

PROCEDURE

EACH CHILD WAS TESTED UNDER ALL MELODY CONDITIONS AT ONE RATE.

A GO/NO-GO CONDITIONED HEAD-TURN PROCEDURE WAS USED (SEE **FIGURE 2**).

THE DATA ARE SHOWN IN **FIGURE 3** AND CONSISTED OF THE PROPORTION CORRECT RESPONSES MINUS FALSE ALARM RATE (I.E., RESPONSES ON CONTROL TRIALS).

1. GENERALLY, DISCRIMINATION PERFORMANCE DECLINED WITH INCREASING RATE OF PRESENTATION.

2. AT THE SLOWEST RATE, TODDLERS ONLY DISCRIMINATED CHANGES IN FREQUENCY, WHEREAS PRESCHOOLERS ENCODED RELATIONAL INFORMATION AND ALSO DISCRIMINATED INTERVAL AS WELL AS CONTOUR CHANGES.

3. AT THE FASTEST RATE, TODDLERS ONLY DISCRIMINATED CHANGES THAT SIMULTANEOUSLY INVOLVED BOTH INTERVAL AND CONTOUR CUES, WHEREAS PRESCHOOLERS DISCRIMINATED EITHER CUE IN ISOLATION.

4. AT INTERMEDIATE RATES, CHILDREN AT BOTH AGES WERE SENSATIVE TO RELATIONAL INFORMATION AND DISCRIMINATED INTERVAL AS WELL AS CONTOUR CHANGES.

1. THESE FINDINGS SUGGEST THAT WITH INCREASING TASK DIFFICULTY (I.E., RATE OF PRESENTATION) THERE IS A SHIFT FROM ENCODING SPECIFIC (E.G., FREQUENCIES) TO MORE GENERAL (E.G., CONTOUR) PATTERN FEATURES OF MELODIES.

2. DISCRIMINATION OF AUDITORY PATTERN FEATURES AT ANY AGE REPRESENTS AN INTERACTION OF THE INFORMATION-PROCESSING ABILITIES OF THE LISTENER AND THE DEMANDS OF THE TASK. THUS, THE BASES OF AGE DIFFERENCES IN PATTERN PERCEPTION PERFORMANCE MUST BE CAREFULLY EXAMINED.

TABLE 1

MELODY	AUDITORY CUES F	I	C	FREQUENCIES (Hz)						CONTOUR				
STANDARD				294	247	220	349	262	294	-	-	+	-	+
TRAINING	X	X	X	294	440	311	220	392	294	+	-	-	+	-
TESTING:														
(1) NOVEL NOTES (TRANSPOSITION)	X			311	262	233	370	277	311	-	-	+	-	+
(2) NOVEL INTERVALS WITH:														
(a) FAMILIAR NOTES		X		294	262	247	349	220	294	-	-	+	-	+
(b) NOVEL NOTES	X	X		294	233	208	349	277	294	-	-	+	-	+
(3) NOVEL INTERVALS & CONTOUR WITH:														
(a) FAMILIAR NOTES		X	X	294	262	349	220	247	294	-	+	-	+	+
(b) NOVEL NOTES	X	X	X	294	277	349	208	233	294	-	+	-	+	+

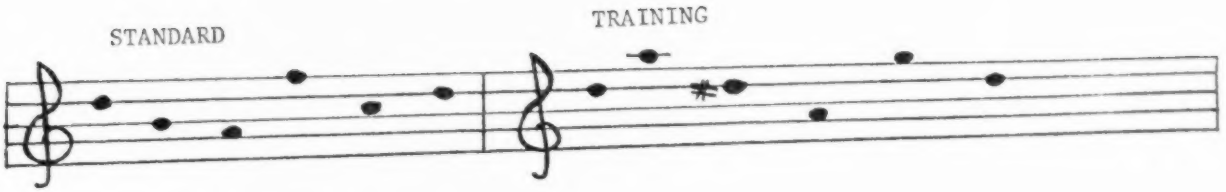
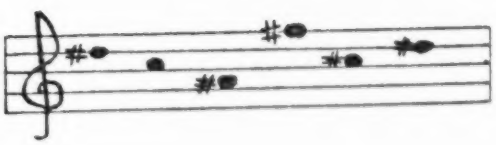
Note: F = FREQUENCIES (THE NOTES OF THE MELODY)

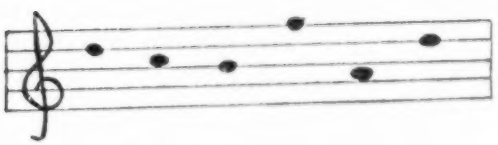
I = INTERVALS (RATIO BETWEEN SUCCESSIVE NOTES)

C = CONTOUR (SEQUENCE OF RISING AND FALLING NOTES)

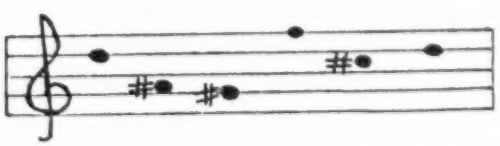
\+ SIGN DENOTES ON ASCENDING INTERVAL

\- SIGN DENOTES A DESCENDING INTERVAL

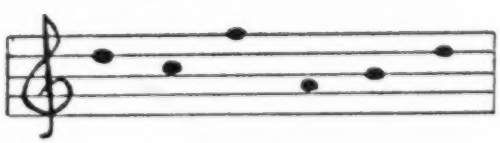
FIGURE 1 : THE SEQUENCE MELODIES IN MUSICAL NOTATION

NOVEL FREQUENCIES (TRANSPOSITION)



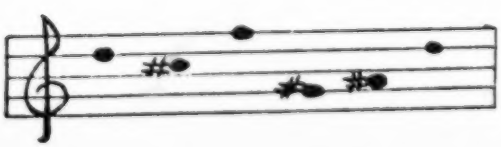
NOVEL INTERVALS - FAMILIAR FREQUENCIES



NOVEL INTERVALS - NOVEL FREQUENCIES



NOVEL INTERVALS & CONTOUR - FAMILIAR FREQUENCIES



NOVEL INTERVALS & CONTOUR - NOVEL FREQUENCIES

FIGURE 2

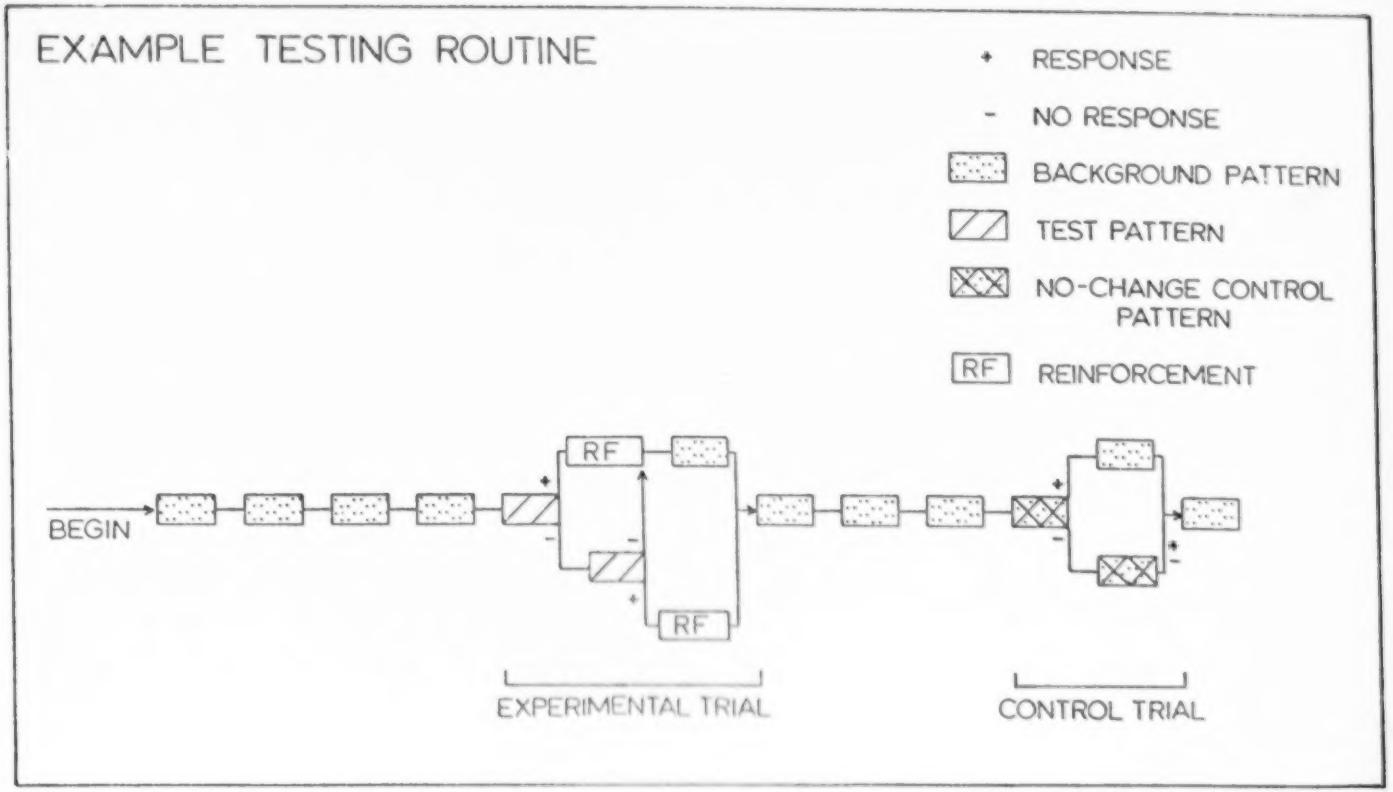
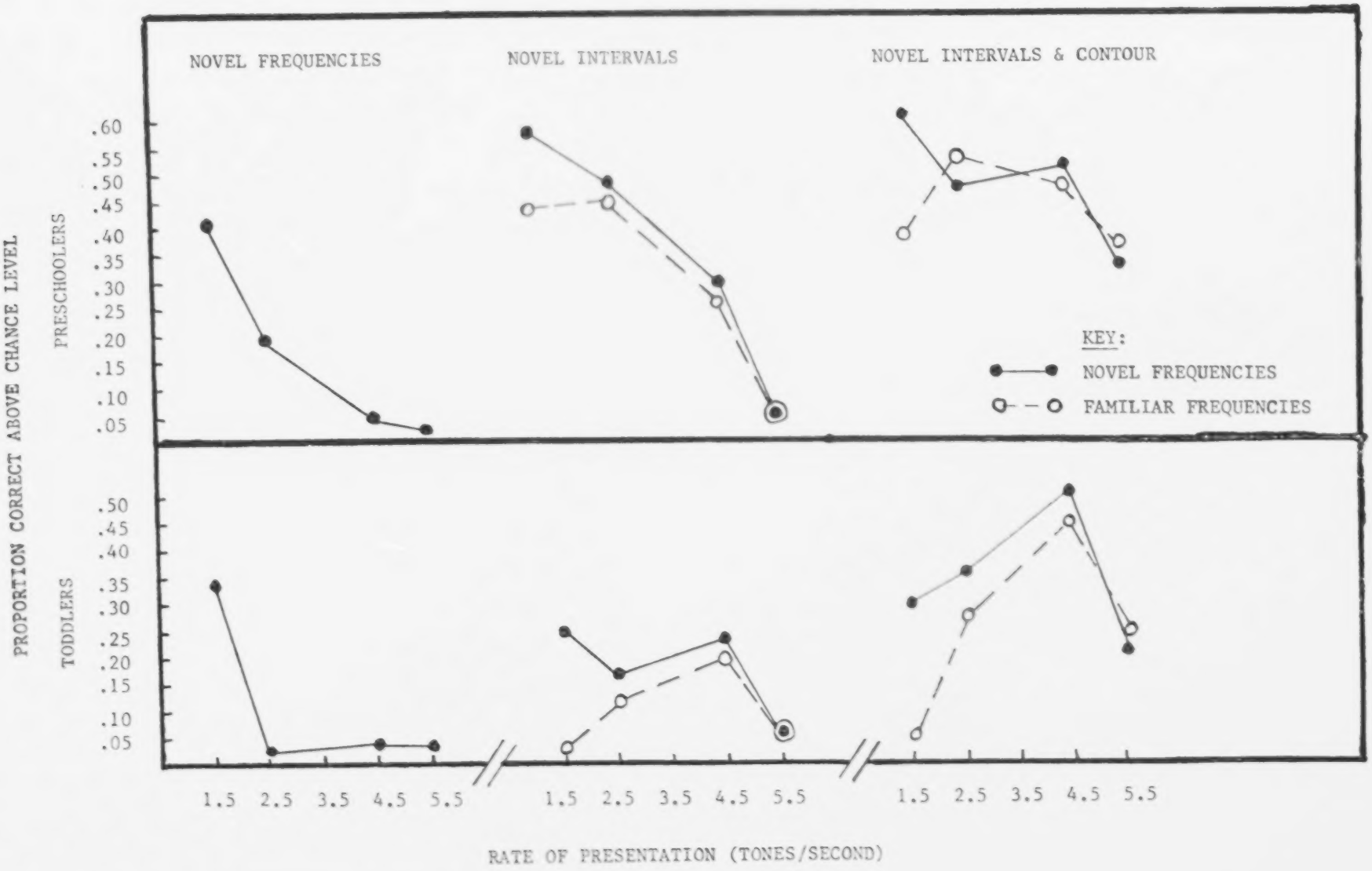

EXAMPLE TESTING ROUTINE
+ RESPONSE
- NO RESPONSE
BACKGROUND PATTERN
TEST PATTERN
NO-CHANGE CONTROL PATTERN
RF REINFORCEMENT
BEGIN
RF
RF
EXPERIMENTAL TRIAL
CONTROL TRIAL

FIGURE 3


NOVEL FREQUENCIES
NOVEL INTERVALS
NOVEL INTERVALS & CONTOUR
PROPORTION CORRECT ABOVE CHANCE LEVEL
PRESCHOOLERS
TODDLERS
.60
.55
.50
.45
.40
.35
.30
.25
.20
.15
.10
.05
KEY:
NOVEL FREQUENCIES
FAMILIAR FREQUENCIES
1.5 2.5 3.5 4.5 5.5
RATE OF PRESENTATION (TONES/SECOND)